Measles

CLINICAL CASE DEFINITION

An illness characterized by all of the following:

- a generalized rash lasting at least 3 days AND
- a temperature of 101° F (38.3°C) AND
- at least one of:
  - cough,
  - coryza (runny nose), or
  - conjunctivitis (redness and inflammation of the conjunctive which lines the eyelid and covers the eyeball)

CASE CLASSIFICATION

- **Suspect:** Rash illness with fever

- **Probable:** A case that meets the clinical case definition, has non-contributory or no serologic or virologic testing, and is not epidemiologically linked to a confirmed case.

- **Confirmed:** A case that is laboratory confirmed (see LABORATORY CONFIRMATION, below), or that meets the clinical case definition AND is epidemiologically linked to a confirmed case. A laboratory-confirmed case does not need to meet the clinical case definition.

TRANSMISSION

- Person to person via airborne transmission or droplets shed from the respiratory secretions of infected persons.
- Droplets can become aerosolized and remain suspended in the air for an extended period of time (documented up to 2 hours). Measles is highly communicable.

INCUBATION PERIOD

From exposure to prodrome (symptoms preceding rash) the average is 10 – 12 days. From exposure to rash onset the average 14 days (range 7 – 18). See Measles Timeline, below.

PERIOD OF COMMUNICABILITY

From 4 days before rash onset to 4 days after.

REPORTING/INVESTIGATION

- Health care providers should **immediately** report any possible case of measles to local health department of the patient's residence.

- Local health department responsibilities:

  - Contact case/guardian and health care provider.

  - Determine if case meets clinical case definition. If definition met (probable or confirmed cases), investigate using report form/surveillance worksheet and control guidelines below.

  - Measles is an important public health concern; if clinical presentation suggests a likely measles case(s), notify MDCH Immunization Division by phone 517/335-8159.

- Report/ensure reporting of case to the Michigan Disease Surveillance System (MDSS). CDC Measles Surveillance Worksheet may be helpful in field investigation to collect and capture data. Obtain immunization history information from provider record or MI Care Improvement Registry (MCIR - state immunization registry).

- Update the MDSS record in a timely manner with new or additional info as it becomes available. Finalize MDSS record when case investigation is complete.

- In the event of a measles-related death, obtain and send copies of hospital discharge summary, death certificate, and autopsy report to MDCH Immunization Division.

LABORATORY CONFIRMATION

Essential; should be attempted for all potential cases meeting the clinical case definition. Laboratory confirmation for measles is defined as one of the following:

- Positive serologic test for measles-specific IgM antibody (**this is the preferred confirmation)**

  NOTE: Measles IgM tests that are negative and were collected less than 72 hours after the rash onset should be repeated using sera collected 72 or more hours after rash onset.

- Significant rise in measles IgG antibody by any standard serologic assay
  - ❑ Collection of sera for these paired assays should be appropriately spaced: 10 or more days should separate the collection of the acute and convalescent sera.
  - ❑ Sera should be tested **in parallel** (i.e., run together in the same test/assay batch).

- Isolation of measles virus from a clinical specimen.

See additional information under LABORATORY SPECIMENS: PROCEDURES AND CONSIDERATIONS, below.

Measles testing is available through the MDCH laboratory but is subject to reagent availability. Pre-approval arrangements must be made through the MDCH VPD Surveillance Coordinator at 517/335-8159. Measles testing (serologic and virologic) is also available through commercial clinical laboratories.

IMMUNITY/SUSCEPTIBILITY

Individuals should be considered immune (protected against) measles **only** if they meet one or more of the following conditions:

- Born before 1957 -- exceptions: women who might become pregnant and health care workers.

- Documentation of a history of physician-diagnosed measles

- Serologic (lab) evidence of immunity to measles

- Documentation of receipt of 2 doses of measles-containing vaccine administered at least 28 days apart.

NOTE: All persons who work in medical facilities should have evidence of immunity to measles, mumps, rubella, and varicella.

CONTROL MEASURES

- Investigate reports of possible measles **immediately**.
- If Clinical Case Definition is met, regard as true measles case; implement control actions unless measles is ruled out by lab testing or other information.
- Cases should be excluded and isolated from group activity settings (e.g. schools, day-care centers, work place, camps, etc.) immediately and through the 4th day after the onset of rash to limit further exposures. In health care settings, use of Airborne Precautions is recommended.
- Identify exposed contacts.
  Measles is highly communicable. Measles cases are communicable (contagious) starting 3-5 days before rash onset through the 4th day after rash onset; exposure includes household contact and same-room contact.
- Assess susceptibility of contacts (see Immunity/Susceptibility, above). Susceptible contacts should be vaccinated with measles vaccine within 72 hours of exposure OR should receive immune globulin (0.25ml/kg [0.11ml/lb]) within 6 days of exposure.
- Persons ≥1 year and <4 years of age should have a history of at least 1 dose of MMR vaccine.
- Persons ≥ 4 years of age and born after 1956 should have a history of 2 doses of MMR vaccine.
- Exclusion of exposed, susceptible contacts: Exposed persons attending group-activity settings (e.g. schools, day-care centers, work place, camps) who cannot readily provide documentation of measles immunity (including those with medical, religious and philosophical exemptions) should be vaccinated or excluded from the setting. Exclusion should continue until 21 days after the onset of rash *of the final case of measles in the group activity setting*. In general, persons who are vaccinated (for the 1st time or receiving a required 2nd dose) may be re-admitted immediately to the activity setting; however, such a re-admittance policy may be modified depending upon the circumstances involved.
- Provide information about measles to persons at risk and/or the general public. An excellent Question-&-Answer measles information sheet in **.PDF** format is available from the Immunization Action Coalition.

LABORATORY SPECIMENS: PROCEDURES AND CONSIDERATIONS

Collect a serum specimen (for confirmation of diagnosis) and a urine, nasopharyngeal, or throat swab specimen (for viral isolation and molecular epidemiology testing); collect both specimens at the same time.

Laboratory support for measles case investigations fulfills 2 important and distinct objectives:

1) laboratory confirmation of cases, involving serologic methods, and

2) molecular epidemiologic characterization of circulating measles virus strains, which involves viral culture methods and viral DNA sequencing techniques.

The importance of obtaining both serologic confirmation and virologic characterization has increased with the setting of national measles elimination goals.

To obtain MDCH serology and virology specimen collection and container kits, call MDCH Laboratory Support Unit: 517/335-9867.

MEASLES SEROLOGY

Purpose: to confirm a case of measles.

Specimen needed: serum, 2 ml.

MDCH lab kit: unit 8

Specimen container: plastic serum tube with skirted cap

MDCH lab form: DCH-0583 (formerly FB 200)

Preferred test: measles IgM antibody. This test is available at MDCH laboratory, using highly sensitive and highly specific direct capture ELISA (EIA) methodology.

Alternate tests: other methods of measles IgM; paired IgG demonstrating significant rise in measles IgG antibody.

Specimen collection/submission procedure:

- Collect at least 5 ml of whole blood in red-top or other tube without anticoagulant. Separate serum from blood by centrifugation and pour into PLASTIC serum tube, store at 2 - 8 C, or freeze serum if it cannot be shipped and received in MDCH lab within 3 days. Do not freeze whole blood.

- Timing of specimen collection
  - **For IgM testing**: collect serum between the 3rd and 30th day after onset of rash.
  - **NOTE**: Measles IgM tests that are negative and were collected less than 72 hours after the rash onset should be repeated using sera collected 72 or more hours after rash onset.
  - **For paired IgG testing**:
    - Acute-phase specimen - collect as soon after rash onset as possible;
    - Convalescent-phase specimen - collect 10-30 days (no earlier than 10 days) after acute-phase specimen.

    Test will be done when both specimens are received (specimens can be sent individually or acute can be held at 2 - 8°C and sent to lab with convalescent specimen). If the specimens are sent to MDCH lab separately, be sure to indicated on the Lab Request form that this is an acute serum and that the convalescent specimen will follow in approximately 10 -14 days.

  - Label tube(s) with patient name, date of birth, and date of specimen collection.

- Complete MDCH Virology Test Requisitions Form DCH-0583 (formerly FB 200); complete all information in the Patient Information and Specimen Information sections.
  - Request “measles IgM” and “rubella IgM” (codes 2820 and 2830, respectively) in the “other” section of the Test Requested area
  - NOTE: testing for rubella is encouraged for all suspected measles cases (likewise, testing for measles is encouraged for all suspected rubella cases).

- Be sure MDCH Immunization Division has been notified of the case investigation.

- Ship specimens on a cold pack by overnight delivery if possible.

- Mail specimens to:

  Michigan Department of Community Health
  Bureau of Laboratories DASH Unit
  3350 N. Martin Luther King Blvd.
  Building 44, Room 155
  Lansing, MI 48909

MEASLES VIROLOGY/MOLECULAR EPIDEMIOLOGY TESTING

Try to collect a urine specimen and a respiratory specimen for viral isolation (in addition to the serum for serologic confirmation described above).

Purpose:

Virus isolates are important for molecular epidemiologic surveillance, specifically to help determine

- the geographic origin of the virus,
- the viral strains circulating in the U.S., and
- whether these strains have become endemic in the U.S.

Isolation of measles virus is not recommended as a routine method to diagnose and confirm measles.

Note: Specimens for measles virology should be routinely collected along with serum when investigating potential measles cases. **Do <u>not</u> delay collection of viral specimens until serologic confirmation is obtained**, since the success of virus isolation is greatest for specimens collected within 7 days of rash onset. Do not collect viral specimens if more than 10 days has elapsed since rash onset.

Specimens:

- Respiratory: nasal wash (nasopharyngeal aspirate) OR nose and throat swabs;
- Urine

MDCH lab kit: 45

Specimen container(s)

- Nasal wash, nose/throat swabs: Viral Transport Media test tube
- Urine: 50 ml centrifuge tube or other sterile container

Specimen collection/submission procedure:

Label all specimen containers used with patient name, date of birth, and date of specimen collection.

Respiratory specimens: Nasal wash, throat swabs, or nasal swabs

- Collect as soon as possible after onset of rash (no later than 7 days after rash onset).

- **Nasal wash**: use syringe with small plastic tube and 3-5 ml of Viral Transport Medium (VTM). Tilt head back, instill VTM in one nostril, holding other nostril closed; aspirate VTM fluid and specimen material quickly and gently. Rinse the tube with approximately 2ml of VTM to obtain any residual specimen.

- **Nose/throat swabs**: Use separate sterile swabs to wipe the nose (anterior nares) and back of throat; try to collect epithelial cells. Place both swabs in a tube containing 2-3 ml of viral transport medium; submerge swabs in transport medium and express the swab against the inside wall of the specimen container. Place swab in a tube containing 2-3 ml of viral transport medium; submerge swab in transport medium and express the swab against the inside wall of the specimen container. Discard swabs, or leave in tube but make sure tube cap is securely screwed on; swab shafts may need to be cut down in order to fit if swab is to be left in tube.

- Keep specimens at 4°C (refrigerated).
- Ship specimens on cold pack by overnight delivery if possible.

If immediate cold shipment (within 48 hours) cannot be arranged or is not convenient:
Nasal wash specimens can be centrifuged at 2500 X g for 15 minutes at 4°C and the pellet re-suspended in 1 ml of tissue culture medium. If possible, the supernatant can be saved in a separate tube. The samples should be frozen and shipped at -70° C (dry ice). If centrifugation is not available, the whole specimen can be frozen (preferably at -70°C) and shipped on dry ice.

Nose and throat swabs can be removed from the transport medium after allowing some time for elution of virus. The specimen can then be frozen at -70°C and shipped on dry ice.

Urine specimens:
- Collect in the first week after rash onset.

- Collect 50-100 ml or urine in a clean urine specimen container (50 ml centrifuge tubes work well); first morning void is preferable, collect urine "clean catch mid-stream."

  - ❑ If centrifugation is available: Centrifuge at 2500 X g for 15 minutes at 4°C to pellet the sediment. Re-suspend the sediment in 2-3 ml of viral transport medium or any cell culture medium. Ship frozen at -70°C on dry ice. If dry ice is not available, store at 4°C and ship on cold pack.
  - ❑ If centrifugation is not available, do not freeze the urine sample. The entire urine specimen should be stored at 4°C and shipped to the lab on cold pack.

- Complete a MDCH Virology Test Requisition Form DCH-0583 (formerly FB 200) for each specimen; complete all information in the Patient Information and Specimen Information sections. Indicate "measles virus by culture" - test code 2240 - in the "other" section of the Test Requested area.

- Mail specimens to:

  Michigan Department of Community Health
  Bureau of Laboratories DASH Unit
  3350 N. Martin Luther King Blvd.
  Building 44, Room 155
  Lansing, MI 48909

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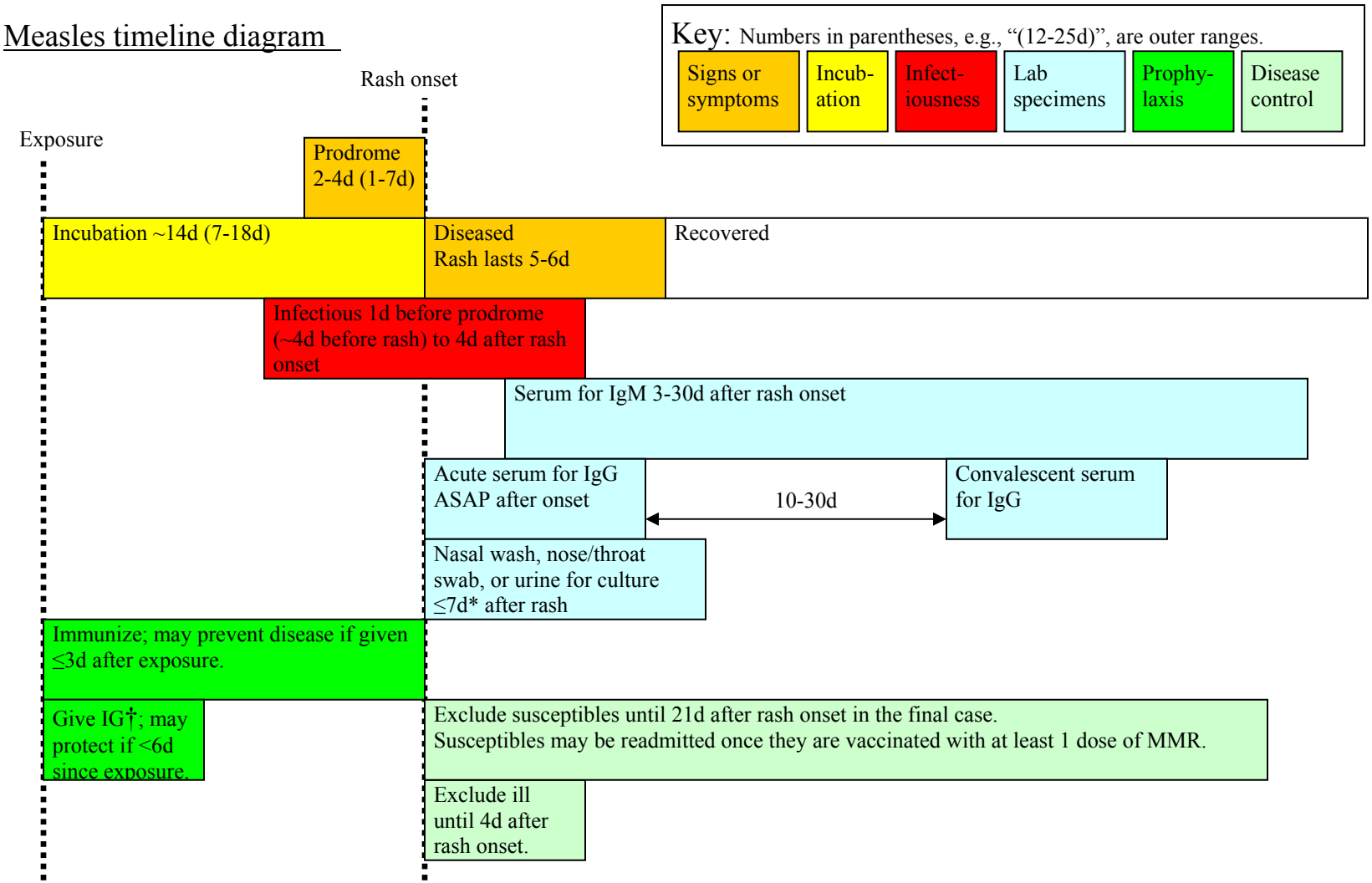
Measles timeline diagram



* For best results with viral culture, collect specimens ≤3d after rash onset. Do not collect such specimens >10d after rash onset.
† Give IG only if the person is immunocompromised, or MMR is contraindicated, or if >72h to <6d have passed since exposure.

Sources: Control of Communicable Diseases Manual, Red Book, Pink Book, CDC VPD surveillance manual